

REMARKS

Claims 1, 3-15, 18 and 22 remain in the application. Claims 2, 16-17, and 19-21 are hereby canceled without prejudice. Claims 1, 3, 4, 6, 8, 11, 12, 13, 14, 18 and 22 are hereby amended. No new matter is being added.

Claim Rejections -- Koenen in view of Elnozahy

The claims stand rejected as being unpatentable over Koenen in view of Elnozahy. Applicants respectfully traverse this rejection in relation to the claims as amended.

Claim 1 has been amended and now recites as follows.

1. A method of rapidly selecting a physical memory locality to accomplish efficient memory allocation in a multiprocessor system, the method comprising:
receiving a locality request from a virtual memory fault handler, the locality request including an indication of a search policy to use from among a plurality of search policies;
forming a data structure **based on** physical memory localities within the system and **the search policy that was indicated**, said data structure including sets of equidistant physical memory localities; and
selecting a preferred physical memory locality using a pointer to a locality within said data structure.

(Emphasis added.)

As shown above, amended claim 1 requires **“receiving a locality request from a virtual memory fault handler, the locality request including an indication of a search policy to use from among a plurality of search policies.”** This claim language is supported in the original patent application, for example, on page 8, lines 10-28, which is reproduced below for convenience of reference.

FIG. 5 is a flow chart depicting a process flow for requests to a VM locality module in accordance with an embodiment of the invention. At the VM fault module 406 (or other module 414), a need arises 502 for an initial locality selection. For example, to deal with a page fault by the VM manager 404, the VM fault module 406 may need to allocate one or more pages of physical memory. **The VM fault module 406 then sends 504 a “best” locality request to the VM locality module 408. In accordance with an embodiment of the invention, the best locality request includes locality searching parameters. In one embodiment, some of the parameters may be passed using a set of flags. The set of flags may include a flag or flags to indicate the search policy to be applied. In one example, the search policy may be an “interleaved first” policy. Such an interleaved first policy is discussed further below in relation to FIG. 6. In another example, the search policy may be a “closest first” policy. Such a closest first policy is discussed further below in relation to FIG. 7. Other policies may also be used. The parameters passed may also include a flag indicating whether the search policy is mandatory or advisory. In certain cases, the parameters passed may also include a desired locality, if any. The response of the VM locality module 408 to the “best” locality request is discussed further below in relation to FIG. 8.**

(Emphasis added.)

Amended claim 1 further requires **“forming a data structure based on ... the search policy that was indicated.”** Examples of such data structures with are shown, for example, in FIGS. 6 and 7 of the present application, which are reproduced below for convenience of reference.

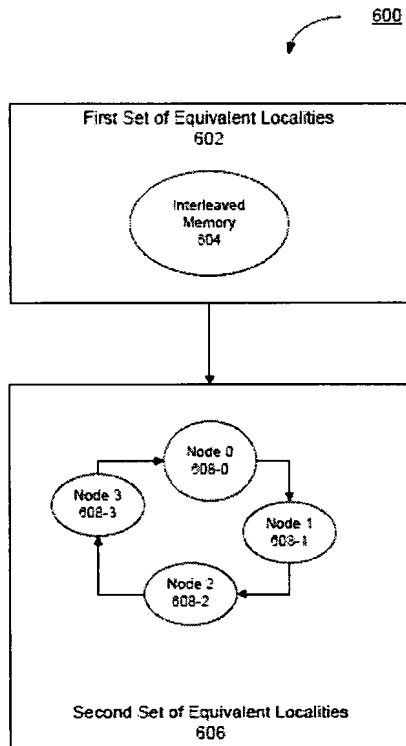


FIG. 6

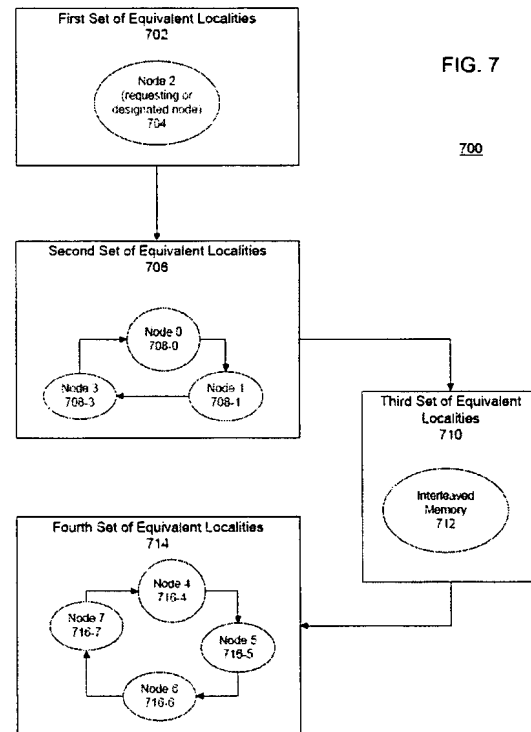


FIG. 7

As explained in the present application, “FIG. 6 is an example diagram depicting an example iterator structure 600 under an ‘interleaved first’ policy in accordance with an embodiment of the invention.” (Page 9, lines 3-4.) “FIG. 7 is an example diagram depicting an example iterator structure 700 under a ‘closest first’ policy in accordance with an embodiment of the invention.” (Page 9, lines 26-27.)

Applicant respectfully submits that neither Koenen, nor Elnozahy, nor the combination thereof, teaches the above-discussed limitations of claim 1. More particularly, neither Koenen, nor Elnozahy, nor the combination thereof, teaches **“receiving a locality request from a virtual memory fault handler, the locality request including an indication of a search policy to use from among a plurality of search policies” and “forming a data structure based on ... the search policy that was indicated.”**

Regarding Koenen, the data structures in Tables 2 and 3 are not based upon a search policy that was indicated in a locality request from a virtual memory fault handler. Rather, Tables 2 and 3 merely show a fixed correlation between physical memory addresses and CPUs in the system. As explained in Koenen, "This physical memory address to CPU correlation is shown in Tables 2 and 3. The tables would be read in from a non-volatile memory during system initialization by code in the firmware of the system." (Koenen, paragraph [0026]).

Elnozahy also does not teach receiving an indication of a search policy to use **in a locality request from a virtual memory fault handler** and forming a data structure based on the indicated search policy. Elnozahy specifically states, "The memory allocation policy may be **globally defined or specified by the application program developer directly.**" (Column 6, lines 49-51, emphasis added.) Elnozahy further recites that "... an application programmer may actively control the memory affinity policy by including NUMALLOCs (or direct MAPMEM device driver calls) in the source code." (Column 7, lines 12-15.) Hence, Elnozahy does not teach that a search policy is received **in a locality request from a virtual memory fault handler** and that a data structure is formed based on that indicated search policy.

For at least the above-discussed reasons, applicant respectfully submits that amended claim 1 is now patentably distinguished over Koenen in view of Elnozahy.

Claims 3-10 depend from claim 1. Hence, applicant respectfully submits that claims 3-10 are now also patentably distinguished over Koenen in view of Elnozahy for at least the same reasons as discussed above in relation to claim 1.

Claim 11 is amended in a similar manner as claim 1 in that it recites that "the VM locality module is configured to receive a locality request from the VM fault handler, the locality request including an indication of a search policy to use from among a plurality of search policies, and is further configured to form a data structure based on the search policy that was indicated." As such, for at least the

same reasons as discussed above in relation to claim 1, claim 11 is now also patentably distinguished over Koenen in view of Elnozahy.

Claims 12-15 and 18 depend from claim 11. Hence, applicant respectfully submits that claims 12-15 and 18 are now also patentably distinguished over Koenen in view of Elnozahy for at least the same reasons as discussed above in relation to claim 11.

Claim 22 is amended in a similar manner as claim 1 in that it recites that "a virtual memory locality module configured to receive a locality request from the virtual memory fault handler, to form a data structure having sets of equidistant physical memory based on a search policy indicated in the locality request," As such, for at least the same reasons as discussed above in relation to claim 1, claim 22 is now also patentably distinguished over Koenen in view of Elnozahy.

Claim Rejections -- Elnozahy and Koenen further in view of Horstmann

The claims stand rejected as being unpatentable over Elnozahy and Koenen further in view of Horstmann. Applicants respectfully traverse this rejection in relation to the claims as amended.

As discussed above, neither Koenen, nor Elnozahy, nor the combination thereof, teaches the above-discussed limitations of claim 1. More particularly, neither Koenen, nor Elnozahy, nor the combination thereof, teaches **"receiving a locality request from a virtual memory fault handler, the locality request including an indication of a search policy to use from among a plurality of search policies"** and **"forming a data structure based on ... the search policy that was indicated."**

Horstmann is cited for teaching interleaved memory in the system. The addition of Horstmann to Koenen and Elnozahy does not disclose or teach the above-discussed claim limitations of = **"receiving a locality request from a virtual memory fault handler, the locality request including an indication of**

**a search policy to use from among a plurality of search policies” and
“forming a data structure based on ... the search policy that was indicated.”**

For at least the above-discussed reasons, applicant respectfully submits that amended claim 1 is now patentably distinguished over Elnozahy and Koenen further in view of Horstmann.

Claims 3-10 depend from claim 1. Hence, applicant respectfully submits that claims 3-10 are now also patentably distinguished over Elnozahy and Koenen further in view of Horstmann for at least the same reasons as discussed above in relation to claim 1.

Claim 11 is amended in a similar manner as claim 1 in that it recites that “the VM locality module is configured to receive a locality request from the VM fault handler, the locality request including an indication of a search policy to use from among a plurality of search policies, and is further configured to form a data structure based on the search policy that was indicated.” As such, for at least the same reasons as discussed above in relation to claim 1, claim 11 is now also patentably distinguished over Elnozahy and Koenen further in view of Horstmann.

Claims 12-15 and 18 depend from claim 11. Hence, applicant respectfully submits that claims 12-15 and 18 are now also patentably distinguished over Elnozahy and Koenen further in view of Horstmann for at least the same reasons as discussed above in relation to claim 11.

Claim 22 is amended in a similar manner as claim 1 in that it recites that “a virtual memory locality module configured to receive a locality request from the virtual memory fault handler, to form a data structure having sets of equidistant physical memory based on a search policy indicated in the locality request,” As such, for at least the same reasons as discussed above in relation to claim 1, claim 22 is now also patentably distinguished over Elnozahy and Koenen further in view of Horstmann.

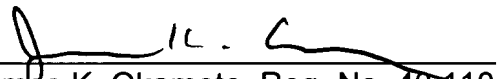
Conclusion

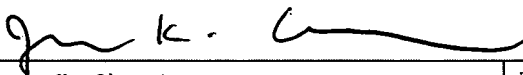
For at least the above reasons, it is believed that the pending claims are patentably distinguished over the applied references and are now in form for allowance. The Examiner is invited to telephone the undersigned at (408) 436-2111 for any questions.

If for any reason an insufficient fee has been paid, the Commissioner is hereby authorized to charge the insufficiency to Deposit Account No. 50-2427.

Respectfully submitted,
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